2021 ASEE ANNUAL CONFERENCE
Virtual Meeting | July 26–29, 2021 | Pacific Daylight Time
Paper ID #33303

Assessing the Effectiveness of Individual Reflections on Video Feedback

Dr. Walter W. Schilling Jr., Milwaukee School of Engineering

Walter Schilling is a Professor in the Software Engineering program at the Milwaukee School of Engineering in Milwaukee, Wisconsin. He received his B.S.E.E. from Ohio Northern University and M.S. and Ph.D. from the University of Toledo. He worked for Ford Motor Company and Visteon as an Embedded Software Engineer for several years prior to returning for doctoral work. He has spent time at NASA Glenn Research Center in Cleveland, Ohio, and consulted for multiple embedded systems companies in the Midwest. In addition to one U.S. patent, Schilling has numerous publications in refereed international conferences and other journals. He received the Ohio Space Grant Consortium Doctoral Fellowship and has received awards from the IEEE Southeastern Michigan and IEEE Toledo Sections. He is a member of IEEE, IEEE Computer Society and ASEE. At MSOE, he coordinates courses in software verification, real time systems, operating systems, and cybersecurity topics.

Assessing the Effectiveness of Individual Reflections on Video Feedback

Abstract: We know from research that feedback to students is a decisive aspect in the learning process. Students learn better when they receive relevant and timely feedback from faculty members regarding their assignments. Multiple studies have shown this. However, if students do not review the feedback, it is not effective, and faculty members routinely speak to anecdotal stories of students disregarding feedback given to them.

In previous papers, the usage of multimedia feedback has been discussed. In essence, with multimedia feedback, traditional written comments are generally replaced with a short, narrated video whereby the feedback is provided both using audio and visual techniques. Overall, this approach has been shown to be quite effective for communicating with students. However, as with traditional feedback, the videos are only effective if students watch them.

This paper will present a modified approach toward video feedback, namely integrating an optional individual reflection into the process. Students who watch the video and complete a brief reflection can make back some points toward their assignment. The paper will show comparisons of student performance across multiple sections using this mechanism, comparing the performance of students who viewed the videos with those who did not as well as students who submitted reflections versus those who did not. The results indicate correlation between both watching the videos and better class performance as well as submitting a reflection and better class performance.

Introduction

> *"It has long been recognized, by researchers and practitioners alike, that feedback plays a decisive role in learning and development, within and beyond formal educational settings. We learn faster, and much more effectively, when we have a clear sense of how well we are doing and what we might need to do in order to improve."* [1]

These words open up Hounsell's article discussing the importance of feedback to the learning process. Overall, we know that giving students effective feedback is one of the most powerful influences of student success [2]. We also know that there are many ways in which feedback to students can fail: feedback which is delivered too late top the student is not timely enough to help them. If feedback is not engaging to the students, they may disregard the feedback entirely.

In previous work, we have investigated the concept of using brief, customized videos to provide students with formative feedback on lab submissions. Overall, these videos were well received by students. In early studies, students generally preferred video feedback over traditional written feedback [3]. In later work, we were able to demonstrate slight improvements in student achievement on assignments [4] [5] based upon viewing of these feedback videos. Further studies by others have supported our results related to student preferences for video feedback [6].

Since the initial work was done, the approach has been routinely used for programming and other lab-based courses, with slight refinements to the technique over the years. In the first iterations, the feedback was emailed to students as an email attachment. This required the instructor to be extremely careful to make sure the file size was small enough to be reliably transmitted. A later version involved the videos being uploaded to a faculty-controlled website, and the students were sent a link that they could use to view their feedback. This allowed for limited analytics about the videos to be captured, namely which links were clicked on and when the video viewing was completed. These analytics, however, were extremely difficult to track, as they were sent via email and needed to be manually manipulated. So, once the initial reviews were completed, much of this analytical data was not tracked.

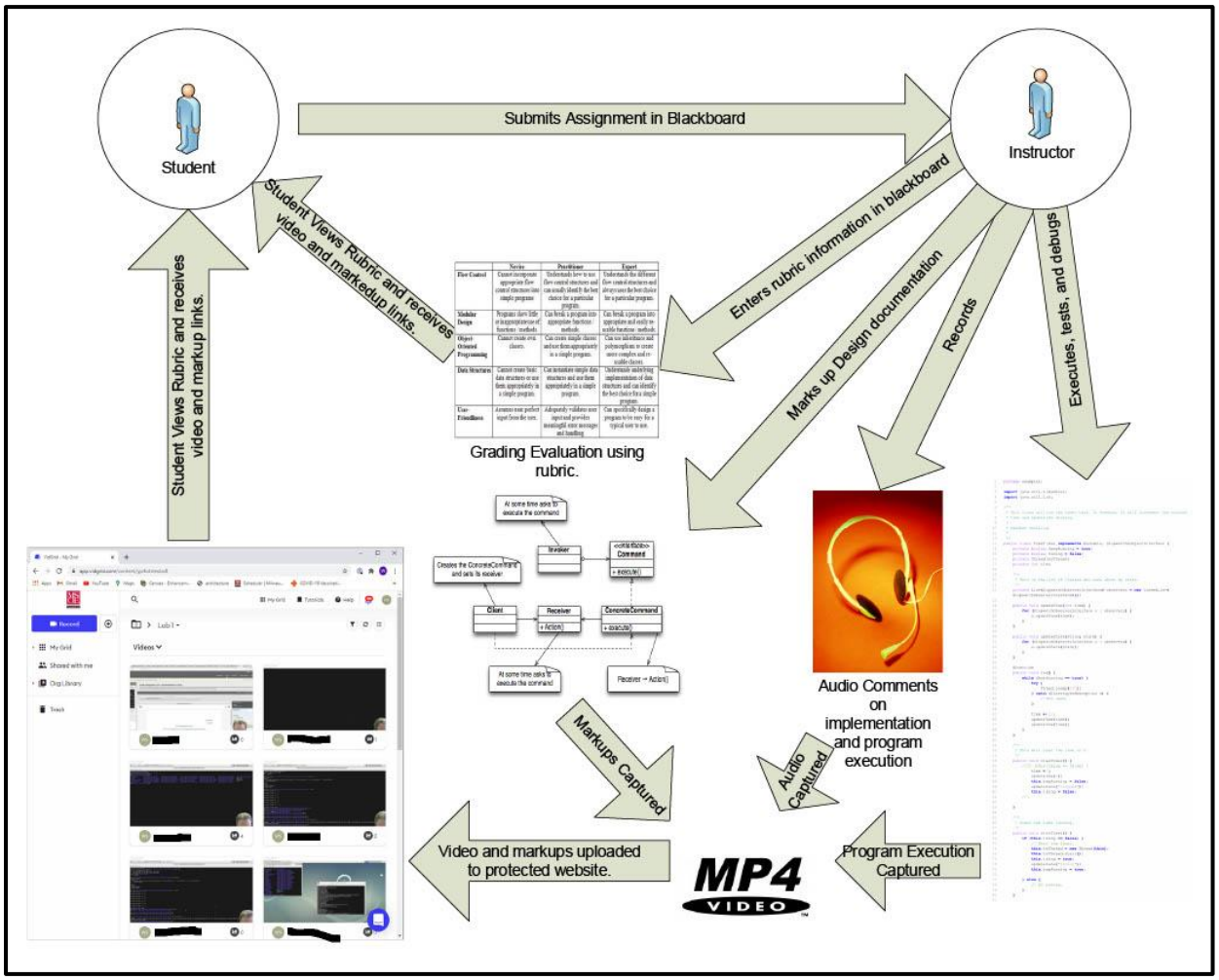

Figure 1: The Video Feedback Process

In the newest form, shown in Figure 1, videos are now uploaded to an Enterprise Video Platform known as VidGrid. In addition to hosting the videos, this platform provides extremely detailed analytics that

were not possible with the faculty-controlled website. The faculty member can now see exactly who watched the video, what their IP address was, as well as which segments of the video were viewed and how many times they were viewed. This additional analytical information, examples of which are shown in Figure 2, greatly enhances the ability of the faculty member to monitor the effectiveness of video feedback.

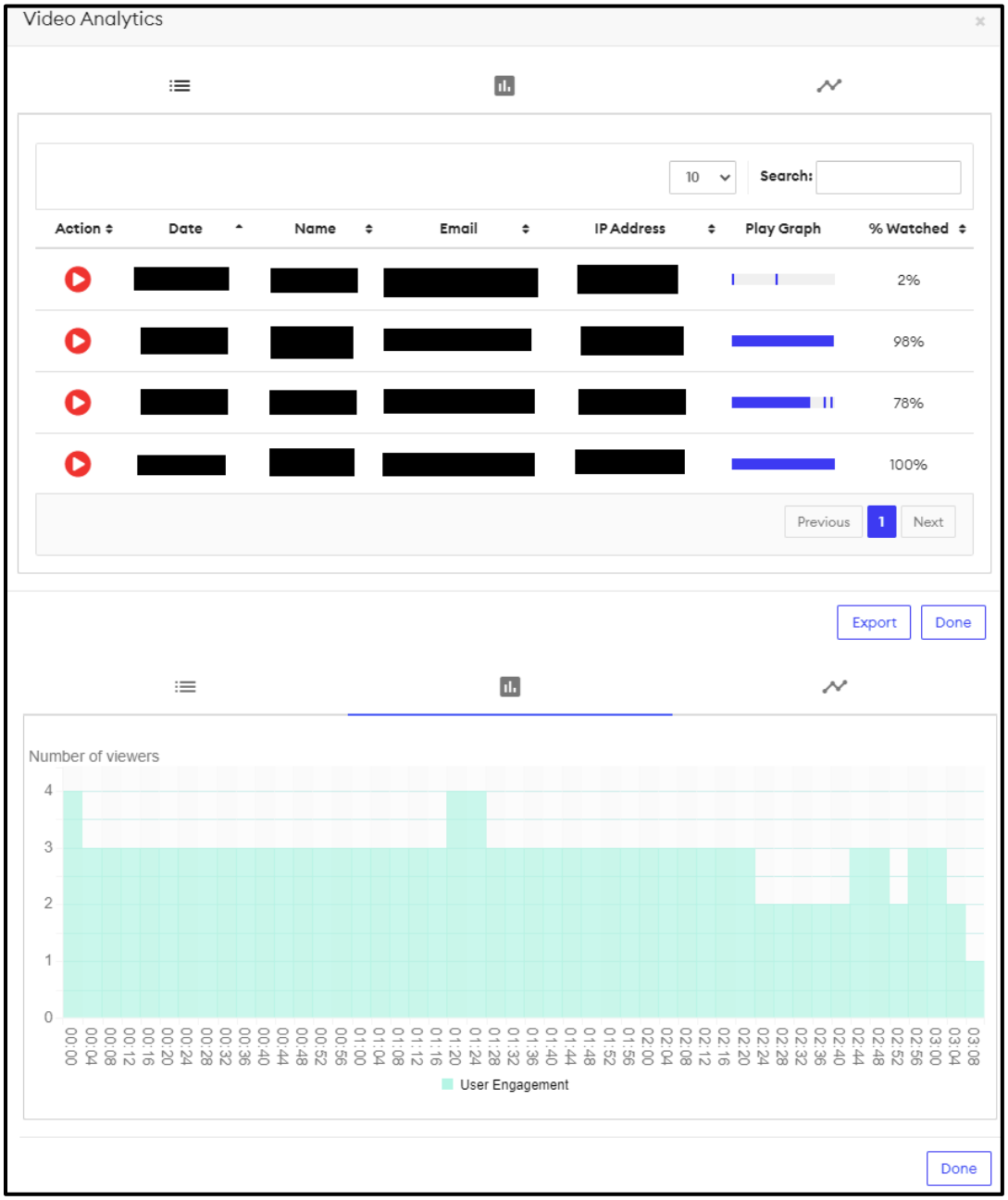

Figure 2: Sample analytics available in the VidGrid Platform

Since the initial work was done, there has been a marked shift in students viewing of the videos. In earlier works, 57% of the students had watched 4 or more of the videos provided to them [4], and in one

of the other studies, 65% of videos were watched by students [5]. With the switch to VidGrid, it was much easier to track these trends, and a pattern appeared to be developing of students not watching the videos. Using the detailed analytical data provided by VidGrid, the percentage of video material watched by students was in the range of 22% to 27%, significantly below what had been seen previously.

As with traditional feedback, we know that if students do not pay attention to the feedback, it is of little use to them. Students not watching the video feedback receive the same amount of feedback as a student who tosses a comments sheet in the trash without viewing it or never opens a grade sheet on an assignment.

In the concept of our work, what was more concerning was that this reduced viewership of videos was still correlated with student's performance when using Spearman's Rank Order Correlation ($\rho(11)=.61$ $P=.043$). Students who did not watch the feedback videos were not learning to the same degree as their classmates.

The Integration of Reflections

One of the techniques to enhance metacognition and student performance is the reflection. Reflective activities are commonly used in the humanities field and have been shown to increase student's depth of reasoning and critical thinking skills [7] as well as help to regulate the learning process [8]. Self-reflection has been shown to increase academic performance [9].

In the computing fields, daily critical reflections are not something that is routinely used by students on the daily assignment basis. Students are taught, for example, within the SCRUM software development framework to perform sprint retrospective at the end of each sprint, identifying what went wrong and what could be improved. While doing personal reflection, this is a slightly different form of reflection, not tied to a specific assignment or specific feedback from the professor.

Given that anecdotally, student comments still were very positive toward the approach, the question was what could be done to increase the number of students who routinely watched the grading videos and what impact would this have on the student's performance in the class?

One approach to this that was considered was directly tying a student's grade to watching the videos. This approach, however, seems punitive to students and may result in students forcibly working around the analytics to "game the system". In previous work, we have had good success with providing a small incentive to students to do optional work. Namely, we have had good luck reducing procrastination by offering a small early submission bonus [10]. Using this as a baseline, the question is could a similar approach increase the number of students who watched the videos as well as their overall understanding of the material? To offer extra credit for simply watching the video again seems counterproductive. While the video system can track students watching the videos, it is unable to tell if the student is cognitively involved in the video or rather is simply playing the video in the background

(or even in a minimized window.) Thus, while the analytics provided system could be beneficial, it may not benefit the student.

To work around this limitation and require at least a minimal level of interaction with the video, students in courses using video feedback were invited to submit a simple reflection on the video. By doing this, students had to watch the video, perform at least a limited assessment of the ideas in the video, and then draft a short reflection. Students who did this then were rewarded with a small amount of extra credit on the assignment.

To standardize the process, the syllabus was revised to include the following statement related to reflections:

> *"When lab grading is completed, students will be provided with two forms of feedback. The first form of feedback will be commentary on the submission. This commentary may take the form of a written document or short video of the grading session. When this is available (i.e. all on time submissions have been graded), this formative feedback will be provided to students. Based on the formative feedback, students may write a brief reflection on the feedback which can be worth an additional 5% on the lab. After a period of 48 hours, then grade sheets will be released with numeric grades on them and the grading rubrics. At this point, no reflections can be submitted for additional credit."*

Data and Data Analysis

The integration of extra credit reflections leads to two research questions. First off, what is the impact on student viewership of videos? Secondly, what is the impact on student's performance in the class relative to watching these videos.

To determine the impact of reflections, we needed to first look back at previous courses to establish a baseline with the data collected and available in VidGrid. One course stood out as being particularly useful, in that it is an introductory programming class, taught to students of multiple majors, and has historical data available from two years prior.

These two classes were analyzed for relevant trends related to video viewership and performance. Versus previous work, there were a significant increase in the number of students who did not watch any of the videos (in 2015 only 11% students watched 0 videos) as well as a decrease in the number of students who watched nearly all of the videos (in 2015 41% watched 5 or more of the videos) [5]. These two classes did not have many statistically significant trends, except that in one of the courses, there was a negative correlation between the students grade and the number of unwatched video minutes. This intuitively makes sense, as a student who received longer videos back likely has more problems with the assignments, and therefore, more to learn from watching the videos. This raw data is shown in Table 1.

Offering	Course Enrollment	Percent of Video Minutes Watched	Percent of Students watching n feedback videos						Spearman's Rank Correlation between unwatched minutes of video and Grade
			0	1	2	3	4	5 or more	
1	15	21.4%	46%	13%	7%	0%	13%	20%	ρ(15)=-0.625 p = 0.012
2	21	26.8%	29%	5%	19%	19%	5%	25%	ρ(21)=-0.470 p = 0.032

Table 1: Raw Data from previous course offerings

We then compared these with the same data taken from the most recent offering of the course, in which a reflection bonus was offered. These raw results are shown in Table 2 and Figure 3.

Course Enrollment	16					
Percent of Video Feedback Minutes Watched	65%					
Number of Videos in which at least n% of the video was watched (total videos 125)	50%		70%		95%	
	94		92		84	
Average (Median) Video Length (mm:ss)	5:08 (4:52)					
Percent of students watching n feedback videos	0	1	2	3	4	5 or more
	25%	0%	6%	0	6%	62.5%
Students Submitting Reflections	0	1	2	3	4	5 or more
	31%	6%	0%	13%	0%	51%
Spearman's Rank Correlation between unwatched minutes of video and Grade	ρ(16) = -0.115 P=0.625					
Spearman's Rank Correlation between Percent of Videos watched and Grade	ρ(16) = 0.7662 P=0.001					
Spearman's Rank Correlation between Percent of Videos watched and Lab Grade	ρ(16) = 0.8618 P=0.001					
Spearman's Rank Correlation between number of submitted reflections and Lab Grade	ρ(16) = 0.7625 P=0.001					

Table 2: Experimental Results

Overall, by adding the optional reflection bonus to the class, more students watched the videos than in previous years (even more so than in the initial studies) and the percentages of the video watched seemed to be higher as well. More importantly, as would be expected, there was a correlation between student performance and the percentage of feedback viewed by the students. One important anecdotal observation was that not all the students submitted reflections when they watched the videos. In looking at the data, the percentage of videos that were watched at least in part is higher than the number of reflections. Some students watched the entire video to receive the feedback but did not feel the need to receive extra credit by submitting a reflection.

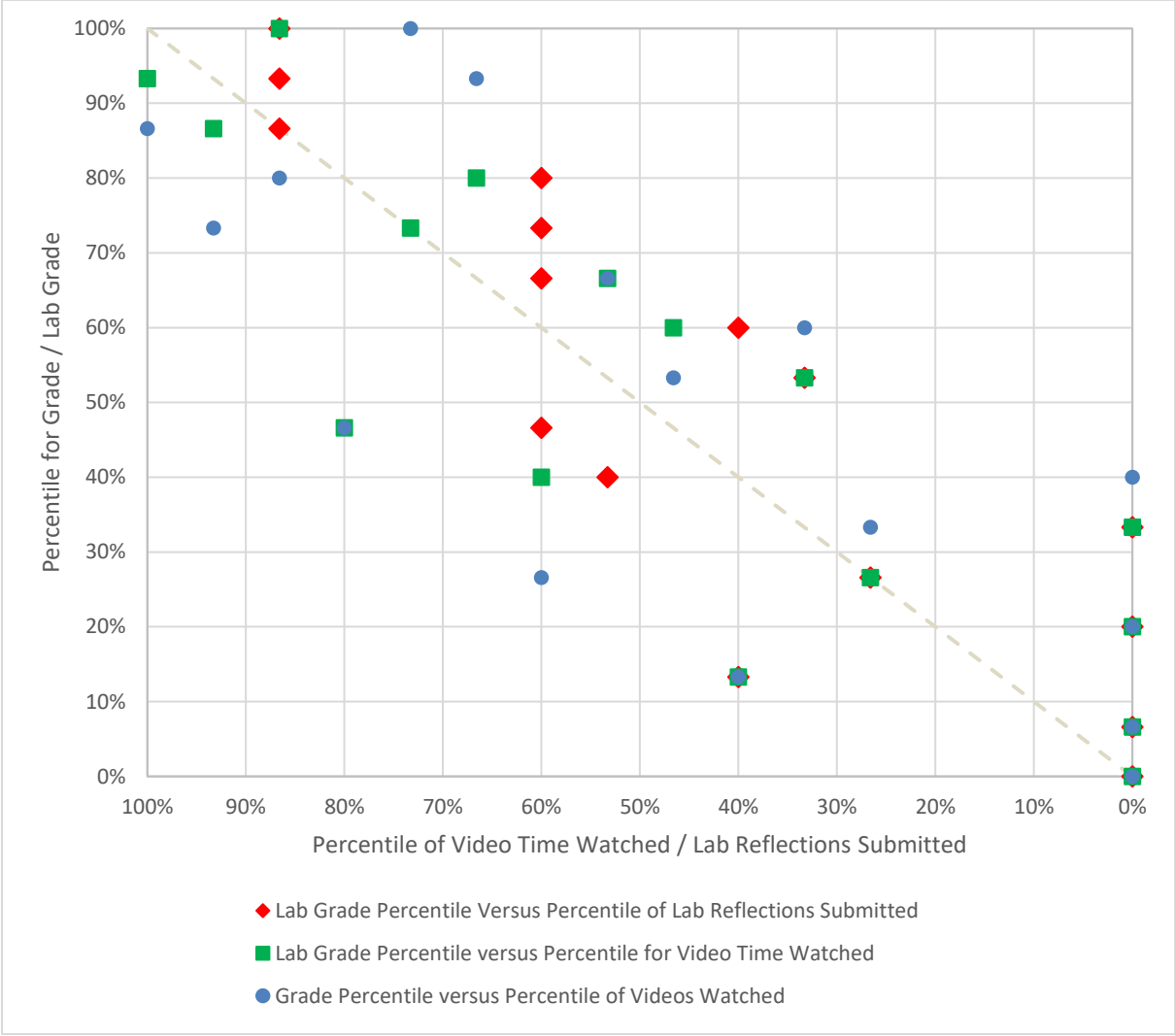

Figure 3: A graphical representation of student performance. In each case the X and Y axis represent the percentile within the class. Grades / Lab Grades (the dependent variable) are shown on the y axis, while the percentile of video feedback viewed / reflections submitted (the independent variable) is shown across the x axis.

Conclusions and Future Directions

From this work, we have seen that there appears to be a benefit of increased engagement and review of feedback if an optional reflective assignment is given. This reflective assignment appears to help the students achieve better performance beyond simply receiving extra credit. Not all students watched the videos because of the extra credit opportunity. Some viewed the videos and then elected to not submit a reflection.

At this point in time, the validity of these results is limited based on the size of the student population. The number enrolled in this class, and thus the size of the experimental group is smaller than would be desired. The results need to be replicated to establish validity.

Another important aspect to consider is the impact of the global Covid-19 pandemic on these results. In the case of the control groups, these courses were taught prior to the onset of the pandemic. The experimental group for which reflections were used was taught during the pandemic, and thus the very pandemic may have impacted the students desire to view the video feedback.

Bibliography

[1] D. Housnell, "Student feedback, learning, and development.," *Higher Education and the Lifecourse,* vol. 01, pp. 67-78, 2003.

[2] J. Hattie, " Identifying the salient facets of a model of student learning: a synthesis of meta-analyses.," *International Journal of Educational Research,* vol. 11, pp. 187-212, 1987.

[3] W. Schilling and J. K. Estell, "Enhancing Student Comprehension with Video Grading," *Computers in Education (CoED) Journal,* vol. 5, no. 1, pp. 28-39, 2014.

[4] W. Schilling, "Assessing the effectiveness of video feedback in the computing field," in *Proceedings of the 2013 IEEE Frontiers in Education Conference (FIE)*, Oklahoma City, 2013.

[5] W. Schilling, "Analyzing the impact of asynchronous multimedia feedback on novice computer programmers," in *Proceedings of the 2015 IEEE Frontiers in Education Conference* , El Paso, 2015.

[6] R. Kay and T. Bahula, "A SYSTEMATIC REVIEW OF THE LITERATURE ON VIDEO FEEDBACK USED IN HIGHER EDUCATION," in *Edulearn20 Proceedings*, Online, 2020.

[7] S. Ash, P. Clayton and M. Atkinson, "Integrating Reflection and Assessment to Capture and Improve Student Learning," *Michigan Journal of Community Service Learning,* vol. 11, no. Spring, pp. 49-60, 2005.

[8] J. Dahlgren, "Reflection's Impact on Student Learning," Moorhead, 2020.

[9] M. Lew and H. Schmidt, "Self-reflection and academic performance: is there a relationship?," *Advances in health sciences education : theory and practice,* vol. 16, no. 4, pp. 529-545, 2011.

[10] W. Schilling, "Using Performance Bonuses to Decrease Procrastination," in *Proceedings of the 2010 ASEE Annual Conference*, Louisville, 2010.